

MARICOPA COUNTY



2020

Eye To The Future

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ENVIRONMENTAL EFFECTS



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ENVIRONMENTAL EFFECTS

Introduction

The Environmental Effects element helps fulfill the requirements of the Growing Smarter Act, and helps ensure that planning for future development in Maricopa County is consistent with federal, state, and local requirements for air quality, water quality, and other elements affecting the environment. This report contains analysis, goals, objectives, and policies that address anticipated effects that development may have on air quality, water quality, noise abatement, and sensitive plant and wildlife species. The objectives and policies developed under this element are designed to have countywide applicability. The report is organized into the following sections:

- ◆ Air Quality Background
- ◆ Regulations and New Developments
- ◆ Generation of Electrical Power
- ◆ Water Quality Background
- ◆ Regulations Governing Water Quality
- ◆ Background Information on Noise
- ◆ Noise Abatement
- ◆ Sensitive Plant and Wildlife Species
- ◆ Environmental Impacts
- ◆ Regulations Protecting Sensitive Plant and Wildlife Species
- ◆ Historic Resources
- ◆ Environmental Hazards
- ◆ Conclusion
- ◆ Goals, Objectives, and Policies
- ◆ Agenda for Action

Air Quality

Air Quality: Background

Many different activities affect air quality. Some of these activities produce a specific pollutant that contributes to air quality degradation. Activities that have been found to affect air quality include construction of new buildings, parking lots, and roadways; movement of vehicles along roadways; movement of vehicles on unpaved roads and vacant land; preparation of agricultural fields for planting; use of paint and cleaning solvents; electrical power generation; gasoline powered lawn and garden equipment; and various types of incineration.

Six pollutants have been identified as detrimental to human health when concentrated in large amounts, and for which standards have been set by the Environmental Protection Agency (EPA). These pollutants are carbon monoxide (CO), nitrogen dioxide



(NO₂), ozone (O₃), lead (Pb), particulate matter (PM₁₀ and PM_{2.5}), and sulfur dioxide (SO₂). National Ambient Air Quality Standards, required by the Clean Air Act, allow the EPA to set two types of standards for pollutants. Primary standards set limits to protect public health. Secondary standards set limits to protect public welfare, including protection against decreased visibility and damage to animals, crops, vegetation, and buildings. Primary standards have been set for CO, while both primary and secondary standards have been set for NO₂, O₃, Pb, PM₁₀, PM_{2.5}, and SO₂.

The EPA normally designates nonattainment areas only after air quality standards are exceeded for several consecutive years. A nonattainment area is defined as a locality where air pollution levels persistently exceed National Ambient Air Quality Standards. Maricopa County has been designated as a nonattainment area for CO, O₃, and PM₁₀.

Air Pollutants

CO is an odorless, colorless, toxic gas formed when carbon-containing compounds or fuels are burned incompletely. CO can cause physiological and pathological changes by damaging red blood cells and interfering with their ability to transport oxygen to body tissues. The primary sources of CO are on-road mobile (automobiles and trucks), non-road mobile (lawn and garden equipment, construction, farm, and recreational equipment, aircraft, and trains), area sources (residential wood and industrial fuel combustion, on-site incineration, and open burning), and point sources (industrial, manufacturing, and electrical power generation facilities). Exposure to elevated CO levels is associated with impairment of visual perception, manual dexterity, learning ability, and performance of complex tasks. CO pollution has reached unhealthy levels in Maricopa County during the winter.

O₃ is a gaseous form of oxygen with three oxygen atoms per molecule, formed by electrical discharge in oxygen. At ground level, O₃ is a primary component of photochemical smog. Health effects of O₃ exposure include damage to the respiratory system, reduced breathing capacity, chest pain, nasal congestion, sore throat, and headache. It presents a serious health threat to people suffering from respiratory disease. O₃ has reached unhealthy levels in Maricopa County during the summer.

PM₁₀ are fine particles suspended in the atmosphere. These particles have an aerodynamic diameter equal to or less than 10 micrometers. The primary sources of PM₁₀ include non-road sources (construction/earthmoving dust, construction trackout, engine exhaust, and construction windblown dust), on-road sources (paved road dust, unpaved road dust, and vehicle exhaust), area sources (disturbed vacant land and agricultural windblown dust, agricultural dust, and residential wood burning), and point sources. When inhaled, the fine particles can be deposited in the lungs, possibly resulting in permanent lung damage. The particles may interfere with the body's mechanism for clearing the respiratory tract and may act as carriers of an absorbed toxic substance. The national standard for PM₁₀ is based on 24 hour standards (150



ugm [micrograms per cubic meter]) and annual standards (50 ugm). Maricopa County Rule 310 for control of Fugitive Dust Sources limits particulate matter emissions into the ambient air from any property, operation, or activity that may serve as a fugitive dust source. Fugitive dust is defined as particulate matter not collected by a capture system that is released in the ambient air and is caused from human and/or natural activities, such as movement of soil, vehicles, equipment, and wind. It is the intent of Rule 310 to minimize the amount of PM_{10} entering the air due to human activities.

$PM_{2.5}$ are minute particles with a diameter less than 2.5 micrometers. They are the dominant cause of the haze known as brown cloud. The haze appears brown due to light absorbed by elemental carbon. On calm fall and winter mornings, cool air near the ground forms a stable layer that traps emissions near the surface of the earth. The primary source of $PM_{2.5}$ is vehicular engine exhaust. The haze produced by these particles is perceived as being unhealthy and can impair visibility. It has been found that non-road, on-road, and area sources of dust are not major contributors to brown clouds. However, dust control measures do provide some alleviation of brown cloud.

Air Quality: Regulations and New Developments

The Clean Air Act of 1970, amended in 1977 and 1990, enables the federal government to participate in regulating pollution from mobile sources such as cars and trucks. Basic vehicular engine design has improved since 1970 with the introduction of catalytic converters that are designed to convert carbon monoxide to carbon dioxide. Passenger cars are capable of emitting 90% less carbon monoxide over their lifetimes than their counterparts in the 1960s. The amount of carbon monoxide produced by each vehicle has been reduced, yet there are many more vehicles on the roads today and miles traveled by each vehicle have generally increased. Unless more effective emission controls are used in the future, carbon monoxide levels will rise as population grows and more and more vehicles take to the road.

Although there have been improvements in fuel reformulations, motor vehicles continue to emit a significant proportion of hydrocarbons (HCs) and nitrogen oxides (NO_x), which are the main ingredients of ground-level O_3 . Alternative vehicle fuels, such as natural gas, produce lower levels of all pollutant emissions than conventional or reformulated gasoline and diesel fuel. Dedicated natural gas vehicles (NGVs) can reduce exhaust emissions of CO by approximately 70%, NO_x by 87%, nonmethane volatile organic compounds by 87%, and carbon dioxide (CO_2) exhaust emissions by 20-30%.

Although air quality regulations and responsibilities are described in detail in the Environmental Element Report, prepared for the *Eye to the Future 2020* Comprehensive Plan, some of the general regulations and responsibilities are included here. The EPA oversees and enforces provisions of the Clean Air Act. The Clean Air Act gives state and local governments primary responsibility for regulating pollution from power plants, factories, and other stationary sources. The Arizona Department of Environmental



Quality (ADEQ) is the state agency responsible for compliance and enforcement for all portable sources of air pollution within the state and all stationary sources outside Maricopa, Pinal, and Pima counties. The state is also responsible for vehicle emission testing, administering the Stage II Vapor Recovery Program, enforcing the Agricultural Best Management Practices Rule, and issuing Air Quality Control permits to industries and facilities that emit regulated pollutants. The Maricopa Association of Governments is responsible for maintaining plans and addressing problems with CO, O₃, and PM₁₀ within Maricopa County.

Maricopa County agencies are responsible for issuing permits for most stationary sources of air pollution emissions, as well as enforcing the county's Fugitive Dust Rule 310, the Trip Reduction Program, the Clean Burning Fireplace Ordinance, and the voluntary Lawn Mower Emission Reduction and Vehicle Retrofit and Repair programs. Maricopa County air quality regulations provide emission standards or limitations for many sources and activities.

Air Quality and Electric Power Generation

Electrical power in Maricopa County is produced by using natural gas, fuel oil, nuclear reaction, or hydroelectric generation. However, fuel oil is used only during peak demand periods. As natural gas or fuel oil combusts, CO, NO_x, reactive hydrocarbons, and CO₂ are emitted into the air. Ground-level ozone is produced in part by NO_x and hydrocarbons. NO_x can adversely affect individuals with asthma and cardiac conditions. CO₂ in the atmosphere has been associated with concerns about global warming.

Although Maricopa County uses primarily the cleanest methods of generation (natural gas, nuclear reaction, or hydroelectric generation) to produce electricity, the increased demand for electrical power as the population grows can increase the amount of CO, NO_x, reactive hydrocarbons, and CO₂ released into the air. It is important now and will become more important in the future to find ways to reduce the demand for electrical power. Conservation of energy may be the only means of reducing emissions from power plants in the future.

Water Quality

Water Quality: Background

In general, water resources in Maricopa County are of acceptable quality for most uses. Most water supplies can be treated to meet federal and state drinking water standards. Land activities such as development of urban areas continue to degrade and deplete available water supplies. Reclaimed water may be discharged into surface water and into the ground to replenish water supplies. Agricultural practices can cause pesticides and fertilizers to run off into surface water bodies and leach into groundwater aquifers. Land development can accelerate the erosion of soil into and the accumulation of



sediment in surface water bodies if not properly designed. Leaking underground gas and oil tanks discharge contaminants into groundwater aquifers. Discharge of nitrates from septic systems and other wastewater systems can contaminate groundwater if systems are not properly designed. Degrading pollutants include disease-causing agents, oxygen-demanding wastes and compounds that negatively effect the environment and human health. Disease-causing bacteria and viruses can enter water from domestic sewage and animal wastes. Oxygen-demanding wastes and inorganic plant nutrients such as nitrate and phosphate compounds can deplete surface water of dissolved oxygen. Contaminating inorganic and organic chemicals, oil, gasoline, pesticides, and cleaning solvents can leach into groundwater or be carried by runoff into surface waters unless properly controlled. Insoluble particles of soil, silt, or other solid materials that become suspended in water are the largest source of water pollution in terms of total mass. Discharges from industrial dumpsites and landfills can cause groundwater contamination by volatile organic compounds (VOCs), usually associated with improper disposal of industrial solvents. Wastewater treatment plant discharges and nonpoint dispersal of nitrates and phosphorus from farms and feedlots can create surface water and groundwater contamination if not properly controlled. Agricultural irrigation can drive soluble contaminants into groundwater.

Surface water in Maricopa County is generally of a quality acceptable for most uses after appropriate treatment. However, the water quality in Painted Rocks Lake on the Gila River (southwestern Maricopa County) is the exception. Most surface water in the county, including water that flows over land surfaces, flows to this lake, resulting in a build up of pollutants carried downstream to this point. Painted Rocks Lake State Park has been closed to the public since 1989 due to contamination of the lake from these pollutants. In 1991, it was found that the long-term consumption of fish from the lake and from upstream along the Gila River could result in a greater than acceptable lifetime cancer risk.

Central Arizona Project (CAP) water, which comes from the Colorado River, is treated by water providers to meet drinking water standards established by the EPA for municipal and industrial uses. Levels of total dissolved solids (TDS) in CAP water are higher than in groundwater, but this is generally true of river water. TDS are measured by the amounts of calcium, magnesium, bicarbonate, sodium, and sulfate in the water.

Much of the groundwater in Maricopa County is of acceptable quality for most uses. Some of the groundwater aquifers, however, have been degraded as a result of contamination. Nitrates from industrial sources, wastewater treatment plants, septic tanks and leach fields, and agricultural fertilizers, sulfates from mining areas, agricultural land, and areas of natural mineralization, and volatile organic compounds (VOCs) from manufacturing, industry, and landfills contaminate some of the groundwater aquifers in the county. Petroleum hydrocarbons from leaking underground storage tanks and pesticides from agricultural activities have degraded aquifers to some



extent. Naturally occurring elements such as arsenic, fluoride, and radon have been found at elevated levels in some groundwater aquifers in Maricopa County.

Sources of Water Pollution

There are both point and nonpoint sources of water pollution. Point sources are places where polluting substances enter surface water from a confined, discernible conveyance such as a sewer pipe, culvert, or other channel or conduit. These substances usually originate in industrial facilities and municipal or private sewage systems. Nonpoint sources of pollution are those that cannot be precisely located. Common pollutants include sediment eroded from soil exposed during construction of homes and industrial and commercial buildings, and pesticides and fertilizers that wash off cropland during rain events. Domestic wastewater may be contaminated with paint, household chemicals, pesticides, industrial wastes, organic material, nutrients, sediment, bacteria, and viruses. This wastewater runs through sewers or leaches through the ground from septic systems. Disposal of paint, pesticides, industrial wastes, and many other contaminants into septic systems is not allowed by law.

Regulations Governing Water Quality

The Clean Water Act is the primary federal law that protects the nation's lakes, rivers, and aquifers. Enacted in 1972, the Clean Water Act's primary objective is to restore and maintain the integrity of the country's waters. The two goals of the Clean Water Act are to eliminate discharge of pollutants into waters and to achieve water quality levels that are fishable and swimmable. The Clean Water Act was amended in 1977 to strengthen controls on toxic pollutants and to allow the states to assume responsibility for carrying out federal programs. The adoption of the Water Quality Act in 1987 supported new state and local efforts to deal with polluted runoff and created funds to provide support for the construction of wastewater treatment plants.

The Federal Water Pollution Control Act established a National Pollutant Discharge Elimination System (NPDES) requiring permits for all point sources of pollution to surface waters of the nation. When a potential discharge of pollutants is made to groundwater, an Aquifer Protection Permit (APP) is required by law. When issued, the NPDES and APP permits regulate what may be discharged and the amount of each pollutant allowed to be discharged from a facility. At the state level, water quality standards are set by ADEQ. The agency is responsible for the Point and Nonpoint Source Control programs as well as the APP Program, development and implementation of Best Management Practices for timber industry activities, grazing activities, urban runoff, sand and gravel operations, and farming and animal feeding operations, and the Pesticide Contamination Prevention Program. ADEQ implemented the Wastewater Reuse Permit Program to regulate facilities reusing wastewater for agricultural, lake filling, and golf course irrigation purposes. Groundwater is protected to drinking water standards by the 1986 Arizona Environmental Quality Act and is monitored by ADEQ.



Water quality in Maricopa County is monitored by ADEQ. This state agency fulfills Clean Water Act mandates for water quality monitoring and assessments. Maricopa County Department of Environmental Services is responsible for water quality compliance and enforcement of drinking water standards within the county. Maricopa Association of Governments (MAG) is designated as the Areawide Water Quality Planning Agency for Maricopa County. As such, MAG oversees the 208 Water Quality Program that establishes a process to ensure that construction of wastewater treatment facilities is coordinated within the county. Maricopa County Department of Environmental Services is responsible for the Drinking Water Program, which regulates public water systems in Maricopa County. Any public water system that serves drinking water to 25 or more people or has 15 or more service connections is governed under this program.

Noise

Noise: Background

Noise is defined as unwanted, offensive or irritating sound that unreasonably intrudes into daily human activities. Noise is created by many sources, a number of which are associated with urban development. Some noise sources include road traffic, airplane and train traffic, construction equipment, manufacturing processes, yard maintenance equipment, and radios and other musical equipment. Urban traffic noise and aircraft noise are considered to be the most pervasive outdoor noise sources.

Noise is not merely an unwanted annoyance, since it negatively affects human and animal health and well being. Health problems related to noise include hearing loss, stress, high blood pressure, sleep loss, lost productivity, and a general reduction in the quality of life people expect. High noise levels can also affect communication between individuals. If noise interferes with communication, perhaps as a plane flies overhead, a helicopter continually circles over a neighborhood or loud music blasts from a car stereo, people will change their conversation and will talk only when absolutely necessary. Traffic noise may eliminate the reception of necessary warning signals, at times posing a threat to individual safety. Noise can also affect the ability of people to concentrate on educational endeavors, such as reading and listening. Background noise may compete for the limited number of channels available in the human brain for information input and therefore can affect learning, concentration, and information gathering. Noise can effect sleep patterns by impeding the ability to stay asleep or to sleep deeply. Individuals that are sleep deprived may be unable to perform at their usual level of efficiency.

Psychological effects of noise exposure include irritability, anxiety, general emotional distress, and anger. Noise can cause people to exhibit such anti-social behavior as aggression and violence and may reduce social interaction and social responsibility. It has been found that living in a noisy environment can lead to what is referred to as a



noncommunicative life-style in which social interaction is avoided and communication is minimized due to noise interference.

Studies performed by the U.S. Department of Housing and Urban Development (HUD) indicate that noise is the most frequently cited undesirable condition that people consider when choosing a place to live. Noise from traffic, aircraft, and construction are cited as the most annoying urban noises. Ambient noise levels in Maricopa County have been increasing over the years as population has increased.

Noise Abatement

Noise abatement is the responsibility of all levels of society, with regulatory responsibility falling to the EPA at the federal level, and counties and municipalities having responsibility for enforcing state and local regulations. Although the 1972 Noise Control Act declared that the policy of the United States is to promote an environment for all Americans free from noise that jeopardizes their health and welfare, the federal government does not have the financial means to enforce noise reduction and abatement regulation. It is essential that all citizens are aware of their individual responsibility to practice noise control out of courtesy and consideration for their fellow citizens. More importantly, communities must realize that efficient noise abatement can be achieved through such things as land use planning, real estate disclosure requirements, and building codes. Additionally, the Federal Aviation Administration (FAA) is responsible for controlling aircraft noise by regulating source emissions, with flight operational procedures, and with management of air traffic control systems and navigable airspace to minimize noise impact on residential areas. Airport proprietors, along with state and local governments, are accountable for land acquisition; airport use restrictions; and land use planning, zoning, and housing regulation that limits the uses of land near airports to those that are compatible with airport operations. In Maricopa County, Luke Air Force Base and Williams Gateway Airport are of particular importance because of their potential impact on unincorporated areas. Both airports create certain noise issues, making compatible land use planning around these airports an important consideration.

Sensitive Plant and Wildlife Species

The richness and diversity of plant and wildlife species in Maricopa County create a unique environment. Mountain ranges, washes, riparian areas, and desert produce a network of wildlife habitats throughout the county. Areas dominated by scrub oak and manzanita, occurring at elevations of 4,000 feet or greater in the extreme north and northeast portions of the county, support diverse species of plants and wildlife, while the flat, low-lying areas contain desert scrub plant communities found in only a few other places in the world.



Vegetation in the low-lying desert areas, known as Arizona Upland Sonoran Desertscrub, Lower Colorado River Sonoran Desertscrub, and Semidesert Grassland consists of a rich variety of palo verde, saguaro, ironwood, yuccas, agaves, desert mallow, desert zinnia, acacias, brittlebush, cacti, jojoba, creosotebush, saltbush, and various perennial and annual grasses. Wildlife supported by these vegetative communities is equally diverse, consisting of pocket mice, kangaroo rats, deer mice, gophers, bats, ground squirrels, shrews, rabbits and hares, badgers, skunks, coyote, foxes, mule deer, and javelina. Bird species in these vegetative zones are numerous and include sparrows, warblers, wrens, grackles, ducks, raptors, woodpeckers, mourning and white-winged doves, Gambel's quail, and hummingbirds. Various species of reptiles and amphibians found in these zones include frogs, salamanders, toads, desert tortoise, turtles, lizards, and snakes. The fish population is largely dominated by non-native, introduced species which include small and largemouth bass, crappie, bluegill, sunfish, walleye, catfish, white and yellow bass, and trout. Native fish species in Maricopa County include chub, dace, suckers, and topminnows.

The remaining county vegetative communities are Interior Chaparral, Great Basin Conifer Woodland, Petran Montane Conifer Forest, and riparian corridors. Vegetation found in these zones include ponderosa pine, Gambel oak, locust, scrub oak, manzanita, juniper, piñon, currants, gooseberries, cliffrose, baberry, saltbush, penstemon, globe mallow, lupine, grasses, and cacti. The riparian corridors support paloverde, ironwood, mesquite, acacia, cottonwood, willow, salt cedar (an invasive, exotic species), sycamore, ash, alder, mulberry, and box elder. Some of the wildlife species found at the lower elevations also exist in these zones. Additionally, raccoons, bobcats, mountain lions, black bear, pronghorn and bighorn sheep, white-tailed deer, muskrats, beavers, and wild turkeys can be found at higher elevations.

Sensitive Plant and Wildlife Species: Environmental Impacts

Most of the described vegetative and wildlife communities are impacted by urban development. As such, it is important to strike a balance between the need to accommodate growth and the loss of some habitat. Road construction and development destroy and fragment wildlife habitat, creating barriers to wildlife movement and increasing habitat edges that make native plants more susceptible to invasive non-native species. Habitat destruction and degradation is the most pervasive threat to species biodiversity. Habitat is isolated, increasing inbreeding of isolated species and decreasing genetic variability. To keep small fragments of habitat viable, it is important that migration corridors exist.

Outdoor recreation that includes off-road vehicle use destroys native plants and grasses, and results in a loss of conditions necessary for natural vegetation to regenerate. Off-road vehicle use has been found to account for significant losses of desert tortoises, by hitting and killing the animals and by collapsing their burrows. Excess noise from off-road vehicles, airplanes, and cars disrupts wildlife activity. Desert



animals require an acute sense of hearing to survive. Exposure to chronic noise can cause hearing loss, decreased food intake, habitat avoidance and abandonment, and reproductive losses when mating calls are not heeded.

Riparian and aquatic habitats are directly impacted by development when washes are channelized or destroyed. These impacts need to be balanced against the need to accommodate a growing population. Precipitation that falls onto impervious surfaces such as roads, driveways, and parking lots flows over land faster than over undisturbed desert, carrying with it contaminants and sedimentation that build up in waterways. Effluent produced in developed areas and released into waterways benefits riparian habitats, but only as long as the amount released is measured against the needs of the habitat. A final impact is the loss of insects, birds, and mammals that act as plant and crop pollinators. Hummingbirds, bees, wasps, moths, butterflies, and bats function as effective pollinators that can be harmed by pesticides and loss of habitat. Education programs may help inform future residents about their potential benefits, and about what environmentally friendly methods are available for pest control.

Regulations Governing Sensitive Plant and Wildlife Species

The Endangered Species Act of 1973 allows the U.S. Fish and Wildlife Service the authority to protect threatened or endangered wildlife and plant species. However, not all sensitive plants and wildlife are designated as such. In fact, there are only 13 wildlife and plant species in Maricopa County that are on the Endangered Species List. The EPA Office of Pesticide Programs is responsible for ensuring that a pesticide will not pose unreasonable adverse effects to human health and the environment. Information on pesticide use limitations intended to minimize impacts on threatened and endangered species is available for each county on the EPA Endangered Species Protection Program website. The Arizona Native Plant Law, administered by the Arizona Department of Agriculture, was established to protect unique Sonoran Desert vegetation, such as the ocotillo, yucca, mesquite, paloverde, ironwood, and the saguaro, barrel, cholla, prickly pear, and hedgehog cacti.

Historic Resources

Historic and prehistoric sites in Maricopa County provide an important link with the past in one of the most interesting areas of the Southwest. Historic resources, including archaeological resources, historic sites, and historic roads allow research into past cultures to learn how area people lived and worked. Preservation of historic sites enables communities to enhance revitalization and stimulates economic growth. Maricopa County's historic resources provide unique educational opportunities for students, visitors, and permanent residents.

The National Historic Preservation Act of 1966, amended in 1980 and 1992, establishes the role of the Federal government in partnership with state and local governments,



Indian communities, and private organizations and individuals in the preservation of prehistoric and historic resources of the United States. It is the policy of the Federal government to provide for the preservation of prehistoric and historic resources and to assist state and local governments, Indian communities, and the National Trust for Historic Preservation in expanding their historic preservation programs and activities. The National Trust for Historic Preservation, formed in 1949, preserves and administers sites, buildings, and objects that are significant in American history and culture. The Secretary of the Interior is authorized to maintain a National Register of Historic Places composed of sites, buildings, districts, structures, and objects significant in American history, architecture, archaeology, engineering, and culture.

Within Arizona, the State Historic Preservation Office (SHPO) assists individuals and groups in the identification, evaluation, protection, and enhancement of historic and archaeological properties. SHPO is responsible for nomination of eligible historic and archaeological properties to the National Register of Historic Places, for performing statewide surveys to identify and evaluate historic structures and archaeological sites, and for reviewing federal and state actions that may affect historic and archaeological properties. They present public education and awareness programs and offer technical assistance to owners of historic properties, local governments, and local preservation commissions. The Arizona Register of Historic Places has adopted the National Register criteria for evaluating eligibility of the state's districts, sites, buildings, structures, and objects worthy of preservation. The Arizona Historic Sites Review Committee reviews nominations and advises the State Historic Preservation Officer on properties that should be placed in the National and Arizona Registers of Historic Places. The Arizona Archaeology Advisory Commission has been instrumental in the development of educational programs such as Arizona Archaeology Awareness Month, Archaeology Expo, and the Site Steward Program. Many other agencies, groups, and individuals at the federal, state, and local level are involved with historic and prehistoric preservation. Detailed descriptions of some of the entities involved and the work they do can be found in the *Eye to the Future 2020* Environmental Element Report.

Archaeological surveys have revealed close to 2,500 archaeological sites in the county. These include Indian ruins, petroglyphs, and pictographs, mines, agricultural fields, dams, quarries, ranches, canals, caves, cemeteries, and ancient watering systems. There are presently 80 sites in Maricopa County listed or eligible to be listed on the National Register of Historic Places. These include buildings, bridges, historic neighborhoods or districts, and numerous Indian settlements. Historical parks and archaeological parks in the county include Indian villages, museums, and houses.

Environmental Hazards

Environmental hazards include air pollution, surface water and groundwater pollution, groundwater withdrawal, soil erosion, degradation of ecological systems, noise pollution, and loss of historic and archaeological resources. Some of these



environmental hazards can create health problems, unsafe conditions, loss of food supply, destruction of species, and loss of a sense of community.

Air pollution created by high ground-level ozone levels is harmful to the respiratory system, carbon monoxide can affect vision and learning ability, and particulate matter can cause lung damage, transfer toxic substances from one area or medium to another, and adversely affect visibility. Recent studies have shown that air pollution, particularly ozone and particulate matter, can exacerbate asthma. Ozone can trigger coughing, painful breathing, and inflammation of airways.

Surface water pollution from bacteria, viruses, and protozoa found in septic systems, storm water drains, and sewage dumped from recreational boats can cause illnesses that range from dysentery to minor respiratory and skin diseases. Toxic organic chemicals and metals from human activities such as farming, mining, and industrial processes can accumulate in fish tissues and adversely affect the health of those who come in contact with them unless appropriate measures are taken to reduce this risk. Water in the southern portion of the Gila River and Painted Rocks Lake in Maricopa County contains high levels of organic chemicals and metals. Sedimentation and siltation, which can be created when soil erodes during farming operations or construction of new urban development, can severely alter aquatic communities, reducing fish populations and disturbing the delicate balance of the system unless appropriate measures are taken to prevent this from occurring.

Groundwater pollution, prevalent in the heavily populated areas in Maricopa County, has degraded the quality of the water to such an extent that some wells used to pump drinking water have been shut down. Fuel leaks and spillage, chemicals used in industrial processes, and pesticides used on golf courses and on agricultural land can pollute groundwater and have the potential to accumulate in animal and human tissues and cause cancers, neurological impairment, and loss of intelligence. Regulations and other controls have been implemented to help reduce these occurrences.

Groundwater withdrawal from aquifers has caused the land in some areas in Maricopa County to subside and fissure. These fissures cause damage to the landscape, roads, and other structures and act as funnels for water pollutants that easily find their way to groundwater aquifers.

Degradation of ecological systems occurs when urban development alters natural drainage patterns by increasing the intensity and magnitude of run-off water and when hydrologic modification such as channelization, damming, and dredging alter the flow of water. This degradation can have dramatic effect on wildlife and can decrease the quality of surface water, making it unsuitable for human consumption unless appropriate measures are taken to lessen or mitigate these impacts.



Noise pollution, which increases as more people move into an area and traffic, construction, and manufacturing noise intensifies, can be detrimental to the ability to function effectively in everyday life. Noise affects sleep patterns, learning abilities, and productivity. Health considerations associated with noise pollution include hearing loss, increased blood pressure, and stress. Psychologically, people can become aggressive, violent, and anti-social as a result of exposure to high levels of and/or continuous noise.

The loss of historic and archaeological resources can occur as urban development progresses. While these losses are not associated with health problems, they do create a void that can never be filled. The destruction of historic and archaeological resources results in loss of valuable information about the past and the ability to learn what life was like before we existed. The sense of continuity and character that historic buildings and artifacts give to communities would vanish and the boost to economic viability that these communities receive from tourists interested in sharing the area's history would no longer be available. As such, the development community should be encouraged to preserve significant archaeological resources.

Summary

Future development in Maricopa County has the potential to add to existing air quality problems. Vehicular traffic may increase as the general population increases. As vehicular traffic increases, pollutants from exhaust combine with fugitive dust from roadways to create air conditions that may be hazardous to health. Additional construction of roadways, housing, and commercial and industrial facilities to accommodate future growth may increase air quality problems. Land use strategies such as encouraging moderate to high density development in areas along planned regional transit system routes, infill development that occurs within existing urban areas, and mixed use development that locates complementary land uses such as housing, commercial, office, services, and public facilities within walking distance of each other should be encouraged as the county continues to grow.

Water quality in Maricopa County is affected by agricultural activities, land development, leakage of vehicle fuels, organic and inorganic materials from sewage and animal wastes, and discharges from industrial dump sites and landfills. Since some water contamination, especially groundwater pollution, is essentially permanent, efforts should be made to ensure that water quality is a high priority. The reduction of agricultural activities in the future will help decrease pollution from pesticide and fertilizer runoff. Continuation of the program to replace leaking underground storage tanks is essential. More efficient treatment of sewage and an increase in direct use of treated wastewater should be considered.

Although recent technology has helped to decrease urban noise sources, noise in communities is increasing. Noise is directly related to population growth, which is important for Maricopa County because the county population is expected to increase



50% over the next 20 years. With this increase in population, vehicular traffic will undoubtedly increase, construction of housing and commercial buildings will increase, and air travel will intensify. Along with these increases, new challenges in noise reduction and abatement will become apparent.

Loss and degradation of habitat that supports sensitive plants and wildlife can be the direct result of urban development, and should be balanced against the need to accommodate future growth. Habitat preservation programs that are comprehensive, integrated, and regional in scope, and that capture the public's imagination are essential to the survival of a number of the plant and wildlife species found in Maricopa County.

There is a vast array of prehistoric, historic, and archaeological sites in Maricopa County. Remnants of Indian communities, Indian artifacts, and gravesites can be found at various locations throughout the county. Areas and objects of historical importance which illustrate the rich agricultural heritage and pioneering spirit that helped develop the county should be preserved for educational purposes and to enrich community spirit. Preservation of existing buildings and structures conserves construction materials and land needed for new buildings. Monitoring development in Maricopa County is necessary to assure the long-term preservation of all known and undiscovered archaeological sites. Implementation of site protection measures for significant sites that are eligible for national register may be necessary. Future development sites should be evaluated for archaeological or historic importance. Involvement with SHPO is necessary to ensure that proposed land development does not affect archaeological and historical resources. A formal relationship with SHPO could be accomplished with county membership in the Certified Local Government program, a program administered by the National Park Service and SHPO to encourage greater awareness of and participation in historic preservation by cities and counties.

Environmental hazards can be harmful to physical and mental health. They can adversely affect the landscape, changing water movement patterns and even creating floods that destroy life and damage property and ecosystems. They can damage the air we breathe and permanently destroy reminders of the past and important learning tools for the future. Residential, commercial, and industrial development changes the environmental landscape in many ways. The previous sections in this element have described the efforts made by local, state, and federal governments, as well as private agencies, to lessen the adverse effects of these environmental considerations and to conserve and protect the resources needed to support the many diverse communities of Maricopa County while addressing the need to accommodate a growing population.

The following goals, objectives, and policies address environmental impacts of future development in Maricopa County on air quality, water quality, noise abatement, protection of sensitive plants and wildlife, historic resources, and environmental hazards.



Goals, Objectives, and Policies

This section identifies comprehensive goals, objectives, and policies to address environmental effects for Maricopa County, and help support and implement *Eye to the Future 2020*. To help understand the intent of these items, the following definitions are provided:

Goal: A concise statement describing a condition to be achieved. It does not suggest specific actions, but describes a desired outcome.

Objective: An achievable step towards a goal. Progress towards an objective can be measured and is generally time dependent.

Policy: A specific statement to guide public and private decision making. It is derived from the goals and objectives of the plan.

The goals, objectives, and policies are the action component for addressing environmental effects in *Eye to the Future 2020*. Therefore, land use decisions should be made in coordination with the goals, objectives, and policies contained in this section.

Goals, objectives, and policies come from the research contained in this report, as well as from discussions with numerous stakeholders and participants.

The following are the goals, objectives, and policies for the Environmental Effects element.

Goal 1: Encourage development that considers environmental impacts on air quality, water quality, and sensitive plant and wildlife species, as well as the impacts that noise exposure has on health and quality of life.

Goal 2: Encourage development that protects, preserves, enhances the use of (where appropriate), and raises the public's appreciation of prehistoric, historic, and archaeological sites, buildings, structures, and objects.

Goal 3: Encourage development that minimizes environmental hazards.

Objective E1 To help improve air quality, encourage mixed use development that reduces vehicle miles traveled (VMT).

Policy E1.1 Encourage land use configurations for all new development that minimizes trip lengths and vehicle trips.

Policy E1.2 Encourage development master plans that offer a mix of residential, commercial, employment, and community service land uses.



- Policy E1.3 Encourage a balance of employment, housing, and retail within new developments that minimizes or eliminates vehicular travel between work, home and shopping.
- Policy E1.4 Encourage provisions for using alternative modes of transportation in new development, including transit stops, bicycle paths, and pedestrian walkways.
- Policy E1.5 Encourage the use of alternative fuel and electric powered vehicles for short trips within mixed use development.
- Objective E2** To help improve water quality, encourage development that minimizes land disturbance to reduce soil erosion and sedimentation in rivers, streams, and washes.
- Policy E2.1 Encourage development that minimizes blading, cutting, and filling.
- Policy E2.2 Encourage development that minimizes disturbance of the natural desert environment and utilizes native soils, plants, and existing topography.
- Objective E3** To help improve water quality, encourage wastewater treatment coordination efforts in newly developing areas.
- Policy E3.1 Encourage the direct use of treated wastewater for non-potable uses, such as agriculture irrigation, golf course and landscape watering, cooling water for power plants, and dust control, to decrease wastewater discharges into surface water.
- Policy E3.2 Encourage the use of treated wastewater to supply vital ecosystems with water flow when water diversion upstream has decreased the natural flow to the areas.
- Policy E3.3 Encourage the organization of wastewater treatment efforts among multiple users.
- Objective E4** Encourage protection and preservation of sensitive plant and wildlife habitat and riparian areas within the framework of state and federal laws, regulations, and guidelines.
- Policy E4.1 Encourage protection of plants identified by the Arizona Native Plant Law.



Policy E4.2 Encourage protection of all endangered and threatened plants and wildlife designated on the Endangered Species List for Maricopa County.

Policy E4.3 Encourage the development of corridors linking established and proposed open space areas to allow migration of wildlife and encourage biodiversity of species.

Objective E5 Encourage noise abatement in new development located near noise generating activities, according to federal, state, and local regulations and guidelines.

Policy E5.1 Encourage compatible land uses in noise problem areas.

Policy E5.2 Encourage disclosure of noise control problems for areas known to have existing problems.

Policy E5.3 Encourage public education emphasizing an individual's responsibility to understand noise control issues and the responsibility each citizen has in noise abatement.

Policy E5.4 Promote development that uses the latest available energy efficiency technology in building materials and construction practices.

Objective E6 Encourage monitoring and evaluation of all sites prior to development for evidence of prehistoric, historic, and significant archaeological sites, buildings, structures, and objects.

Policy E6.1 Encourage cultural resource surveys or building assessments to be completed prior to development activity, with review of results by the state historic preservation office for comment and proposed action, to determine the presence or absence of historic resources.

Policy E6.2 Encourage appropriate treatment measures be taken when significant prehistoric, historic, or archaeological sites, buildings, structures, and objects may be adversely impacted.

Objective E7 Encourage development that protects air quality, water quality, and water resources; that minimizes soil and waterway disturbance; that mitigates noise problems; and that preserves historic resources.

Policy E7.1 Promote development that minimizes grading and blading of the landscape.

Policy E7.2 Promote development that emphasizes protection of waterways.



Agenda for Action

The Agenda for Action identifies long term measures that can be undertaken to implement the objectives and policies in the Comprehensive Plan. It is organized as follows:

Action	Lists the actions necessary to carry out the vision of the Comprehensive Plan.
Purpose	Describes the intent of the action.
Timeline	Establishes when the action should begin.
Elements Involved	Lists the elements of the Comprehensive Plan that are involved in the action.
Department/Agency	Lists the departments and agencies involved in the action.
Implementation Method	Determines if the action is legislative, requires future planning, is an existing process, a departmental procedure, or public information.

Table 1 Agenda For Action				
Action	Purpose	Timeline	Elements Involved	Participants
Historic Resource Management	Meet with Arizona State Historic Preservation Office, Maricopa County Planning and Development, and Maricopa County Community Development to discuss issues and update planners and developers on new regulations governing historic resources	Once a year from adoption of Environmental Effects Element to the year 2020	Environmental Effects	MCP&DD SHPO MCCD



Appendix A: Acronymns

ADEQ	Arizona Department of Environmental Quality
CAP	Central Arizona Project
CO	carbon monoxide
CO ₂	carbon dioxide
EPA	Environmental Protection Agency
FAA	Federal Aviation Administration
HC	hydrocarbon
HUD	United States Department of Housing and Urban Development
MAG	Maricopa Association of Governments
MCP&DD	Maricopa County Planning and Development Department
NGV	natural gas vehicle
NO ₂	nitrogen dioxide
NO _x	nitrogen oxides
NPDES	National Pollutant Discharge Elimination System
O ₃	ozone
Pb	lead
PM _{2.5}	particulate matter 2.5 micrometers
PM ₁₀	particulate matter 10 micrometers
SHPO	State Historic Preservation Office
SO ₂	sulfur dioxide
SRP	Salt River Project
TDS	total dissolved solids
ugm	micrograms per cubic meter
VMТ	vehicle miles traveled
VOCs	volatile organic compounds



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